

CLAIM LISTING SHOWING CLAIM AMENDMENTS

1-34. Cancelled.

35. (New) An electrowinning cell adapted to recover metal ions from a solution as their corresponding elementary metals, comprising:

(a) a reservoir adapted to receive a solution containing metal ions at a selected concentration;

(b) an anode and a cathode disposed in said reservoir, said anode and cathode operative to establish an electric potential difference therebetween;

(c) a filter in fluid communication with said reservoir and operative to receive the solution from a location proximate to said cathode, wherein said filter is operative to retain a first portion of the solution having a first concentration of metal ions and to remove a second portion of the solution having a second concentration of metal ions lower than the first concentration;

(d) return means operative to return the first portion of the solution to said reservoir; and

(e) an activated carbon in fluid communication with said reservoir, said activated carbon operative to reduce a concentration of hydrogen peroxide in the solution.

36. (New) An electrowinning cell adapted to recover metal ions from a solution as their corresponding elementary metals, comprising:

(a) a reservoir adapted to receive a solution containing metal ions at a selected concentration;

(b) an anode and a cathode disposed in said reservoir, said anode and cathode operative to establish an electric potential difference therebetween;

(c) a filter in fluid communication with said reservoir and operative to receive the solution from a location proximate to said cathode, wherein said filter is operative to retain a first portion of the solution having a first concentration of metal ions and to remove a second portion of the solution having a second concentration of metal ions lower than the first concentration;

(d) return means operative to return the first portion of the solution to said reservoir; and

(e) an ion-exchange resin in fluid communication with said filter, said ion-exchange resin adapted to receive said second portion of the solution and operative to remove metal ions from said second portion of the solution thereby to provide a waste solution having a third concentration of metal ions lower than the second concentration.

37 (New) An electrowinning cell adapted to recover metal ions from a solution as their corresponding elementary metals, comprising:

(a) a reservoir adapted to receive a solution containing metal ions at a selected concentration;

(b) an anode and a cathode disposed in said reservoir, said anode and cathode operative to establish an electric potential difference therebetween;

(c) a filter in fluid communication with said reservoir and operative to receive the solution from a location proximate to said cathode, wherein said filter is operative to retain a first portion of the solution having a first concentration of metal ions and to remove a second portion of the solution having a second concentration of metal ions lower than the first concentration;

(d) return means operative to return the first portion of the solution to said reservoir;

(e) a solution holding tank in fluid communication with said reservoir and operative to provide the solution thereto, and including an activated carbon cartridge disposed in fluid communication with said solution holding tank and said reservoir and adapted to receive said solution, said activated carbon cartridge operative to reduce a concentration of hydrogen peroxide in the solution, and further including an ion-exchange resin in fluid communication with said filter, said ion-exchange resin adapted to receive said second portion of the solution and operative to remove metal ions from said second portion of the solution thereby to provide a waste solution having a third concentration of metal ions lower than the second concentration.

38. (New) A method of concentrating metal ions in a solution for use in an electrochemical cell, comprising the steps of:

(a) drawing a portion of a solution containing metal ions from a region proximate to a cathode in an electrochemical cell;

(b) filtering the portion of the solution thereby to create a retentate having a first concentration of metal ions and a permeate having a second concentration of metal ions lower than the first concentration;

(c) returning said retentate to said electrochemical cell; and

(d) contacting said permeate with an ion-exchange resin operative to remove metal ions therefrom thereby to create a waste solution having a third concentration of metal ions lower than the second concentration.

39. (New) A method of concentrating metal ions in a solution for use in an electrochemical cell, comprising the steps of:

- (a) drawing a portion of a solution containing metal ions from a region proximate to a cathode in an electrochemical cell;
- (b) filtering the portion of the solution thereby to create a retentate having a first concentration of metal ions and a permeate having a second concentration of metal ions lower than the first concentration;
- (c) returning said retentate to said electrochemical cell; and
- (d) contacting the solution with activated carbon operative to reduce a concentration of hydrogen peroxide in the solution.

40. (New) A system for reducing metal ions in a solution to their corresponding elementary metals, comprising:

- (a) a fluid source operative to provide a solution containing metal ions at a selected concentration;
- (b) a reservoir in fluid communication with said fluid source and operative to receive the solution;
- (c) an anode disposed in said reservoir;
- (d) a cathode disposed in said reservoir;
- (e) a power source operative to supply electric current to said anode and said cathode;
- (f) a crossflow membrane filter in fluid communication with said reservoir and including a membrane, said filter having a first region on one side of said membrane and a second region on an opposite side of said membrane;

(g) a retentate of the solution disposed in the first region of the filter, said retentate having a first concentration of metal ions;

(h) a permeate of the solution disposed in the second region of the filter, said permeate having a second concentration of metal ions lower than the first concentration; and

(i) a return means operative to return said retentate to said reservoir.

41 (New) A system for reducing metal ions in a solution to their corresponding elementary metals, comprising:

(a) a fluid source operative to provide a solution containing metal ions at a selected concentration wherein said solution includes activated carbon disposed therein;

(b) a reservoir in fluid communication with said fluid source and operative to receive the solution;

(c) an anode disposed in said reservoir;

(d) a cathode disposed in said reservoir;

(e) a power source operative to supply electric current to said anode and said cathode;

(f) a filter in fluid communication with said reservoir and including a membrane, said filter having a first region on one side of said membrane and a second region on an opposite side of said membrane;

(g) a retentate of the solution disposed in the first region of the filter, said retentate having a first concentration of metal ions;

(h) a permeate of the solution disposed in the second region of the filter, said permeate having a second concentration of metal ions lower than the first concentration; and

(i) a return means operative to return said retentate to said reservoir.

42. (New) A system for reducing metal ions in a solution to their corresponding elementary metals, comprising:

(a) a fluid source operative to provide a solution containing metal ions at a selected concentration;

(b) a reservoir in fluid communication with said fluid source and operative to receive the solution;

(c) an anode disposed in said reservoir;

(d) a cathode disposed in said reservoir;

(e) a power source operative to supply electric current to said anode and said cathode;

(f) a filter in fluid communication with said reservoir and including a membrane, said filter having a first region on one side of said membrane and a second region on an opposite side of said membrane;

(g) a retentate of the solution disposed in the first region of the filter, said retentate having a first concentration of metal ions;

(h) a permeate of the solution disposed in the second region of the filter, said permeate having a second concentration of metal ions lower than the first concentration;

(i) a return means operative to return said retentate to said reservoir; and

(j) an ion-exchange resin in fluid communication with said filter, said ion-exchange resin adapted to receive said permeate and operative to remove metal ions therefrom.